

Project Title: Survey of Ethylene Oxide in Lake County, Illinois Using Best Testing Practices

Submitted to: USEPA, Enhanced Air Quality Monitoring for Communities

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Applicant Information: Lake County Environmental Works (LCEW)

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Set-Aside: “Community-based organization set-aside”. Lake County Environmental Works (LCEW) is a 501(c)(3) organization working to address the outstanding concerns about ethylene oxide (EtO) and Environmental Justice for residents in Lake County IL.

Brief Description of Applicant Organization: Two major EtO emitting facilities are located in Lake County: Vantage Oleochemicals in Gurnee and Medline Industries Inc. in Waukegan. LCEW members have worked over the last three years to address outstanding cancer risks associated with elevated EtO levels. Previous air quality testing has not validated that emission controls are adequately protecting the community, downwind EtO emissions appear to be higher than expected levels based on permit models, and possible warehouse EtO emissions have yet to be monitored or controlled. The goal of LCEW is to lead air testing for EtO to address these issues for the community and demonstrate a methodology for other communities.

Project Location: The benefits of this study are expected to impact a number of communities in Lake County, IL. Communities primarily impacted by the two largest users of ethylene oxide (EtO) in the State are in Gurnee, IL 600031 and Waukegan, IL 60085, with close proximity to Park City, IL 60085, and North Chicago, IL, 60064, with a total population of 158,356 (2020 Census). There is also concern about widespread EtO emissions in Lake County IL (population 714,342) from warehouses with recently sterilized medical devices using EtO, located at several sites throughout the county.

Air Pollutant Scope: The project addresses ethylene oxide (EtO) emissions and air monitoring for this pollutant near several emission hot spots in Lake County, IL. EtO is a class 1 carcinogen [1].

Budget Summary:

EPA Funding Requested	Total Project Cost
\$270,349.64	\$270,349.64

Expected Project Period: Jan. 1, 2023, to Feb. 1, 2024 (1-year study, 1-month final reporting.)

Short Project Description: Past EtO air quality testing was found to be of mixed quality with high uncertainty and has yet to independently validate whether emission controls are adequately protecting the community. A primary objective is to implement recent findings and improved practices [2], and retest around the high-use EtO facilities in Lake County. Downwind emissions appear to be higher than expected levels based on permit models; analysis of results will focus on if such discrepancies are due to higher-than-expected emission levels, errors in the permit model, and/or testing error and uncertainty. As well, possible EtO warehouse emissions, which have yet to be studied adequately in Lake County, will be tested under this project. Lastly, a community-based mobile real-time fence-line monitoring system will be developed and studied to complement planned TO-15/TO-15A canister testing.

II Workplan

Section 1. Project Summary – Background and Project Significance: 60% of cancer risk in US communities is due to the presence of ethylene oxide. Two of the largest EtO users in the Midwest (Region 5) are located within three-aerial-miles of each other in Lake County, IL. While state laws were passed in 2019 to manage EtO use, and the IL EPA created permits to manage emission levels to mitigate cancer risk, a great deal of uncertainty still exists for those living near these facilities. Our community remains deeply concerned that the current permit and ILEPA oversight process will not hold these companies within their respective emission limits, which is necessary for maintaining a cancer risk at less than 100 in a million to the public. This study will provide definitive answers to concerned citizens. Details concerning the outstanding issues are as follows:

a. Address need for improved emissions testing to validate existing controls. Three phases of TO-15/TO-15A canister testing was performed in Lake County around the facilities of Medline and Vantage, from June 2019 to May 2020. Trends are presented Table 1 from the Lake County Phase II and Phase III testing, organized by testing period, proximity to Medline and Vantage and wind direction [3]. It is important to separate and study downwind emission from these facilities, as was organized in this table based on available wind direction data. With a limited number of canisters and varying wind direction, assessing what canisters are upwind versus downwind is a critical step to understand the level of emission coming from these facilities.

Table 1. Trends in processing Lake County Phase II and Phase III Testing data [3], evaluated by testing period, canister site / proximity to Medline and Vantage and wind direction (upwind versus downwind) relative to nearest facility

P#	testing period	test number	metric	Medline	Medline	Medline	Vantage	Vantage	Vantage	Reference	Reference	# valid canister samples	# invalid canister samples	% invalid samples
				M1-M5	M1-M5	M1-M5	V1-V5	V1-V5	V1-V5	R1-R2	R1-R2			
		(# 24hr testing periods)		Canisters Upwind of Facility	Canisters Partly Downwind of Facility	Canisters Directly Downwind of Facility	Canisters Upwind of Facility	Canisters Partly Downwind of Facility	Canisters Directly Downwind of Facility	Canisters Upwind of Facility	Canisters Downwind of Facility			
				Wind Loc. 1	Wind Loc. 2	Wind Loc. 3	Wind Loc. 1	Wind Loc. 2	Wind Loc. 3	Wind Loc. 1	Wind Loc. 3			
2A	Oct 26 2019 - Dec 11 2019	16	mean*	0.129	0.517	0.525	0.136	0.839	1.539	0.142	0.320			
2A	Oct 26 2019 - Dec 11 2019	16	median*	0.110	0.330	0.575	0.130	0.230	0.920	0.140	0.320			
2A	Oct 26 2019 - Dec 11 2019	16	samples	59	11	8	52	15	10	31	1	187	5	2.6%
2B	†Dec 14 2019 - Jan 22 2020	13	mean*	0.159	0.149	0.182	0.132	0.154	0.212	0.160	0			
2B	†Dec 14 2019 - Jan 22 2020	13	median*	0.145	0.140	0.190	0.110	0.105	0.200	0.170	0			
2B	†Dec 14 2019 - Jan 22 2020	13	samples	32	21	11	34	16	13	26	0	153	3	1.9%
3A	Apr 4 2020 - Apr 16 2020	5	mean*	0.182	0.336	0.293	0.162	0.342	0.392	0.195	0			
3A	Apr 4 2020 - Apr 16 2020	5	median*	0.120	0.260	0.280	0.110	0.360	0.440	0.225	0			
3A	Apr 4 2020 - Apr 16 2020	5	samples	5	8	8	9	6	9	10	0	55	5	8.3%
3B	†† Apr 19 2020 - May 2 2020	5	mean*	0.298	0.326	0.330	0.355	0.270	0.455	0.429	0			
3B	†† Apr 19 2020 - May 2 2020	5	median*	0.185	0.440	0.190	0.250	0.290	0.490	0.305	0			
3B	†† Apr 19 2020 - May 2 2020	5	samples	8	7	5	13	3	4	8	0	48	12	20.0%

* mean and median values reported in units of µg/m3
† Medline shutdown (to meet new permit requirements). News also broke of Vantage high readings during November 2019 testing.
†† Two very high readings were initially observed near Vantage, but values were later invalidated. Other testing outliers appear present.

- Phase II upwind readings near Vantage and Medline are similar to far field references (R1 & R2) and Willowbrook after Sterigenics shutdown [mean = 0.138 mg/m3, median 0.122 mg/m3]. This was generally expected. Phase II downwind readings near Vantage and Medline are much higher than background, indicating emissions from both facilities (and well above permit models). After the shutdown of Medline and news reports of high emissions (December 12-13, 2019), Phase II downwind readings near Vantage and Medline were found to approach background levels. This indicates a change occurred with both facilities. It was reported that

Medline shutdown to meet ILEPA permit requirements; however, it is still unclear what change happened at Vantage to produce the lower emissions level at downwind canisters.

- Phase III testing had a much higher rate of invalid canisters relative to phase II. This is especially true for the last five periods of testing (after April 19, 2020), where 20% of the canisters were invalidated for pressure anomalies. Upwind and background readings after April 19, 2020 were also much higher than historical background concentrations. This was surprising but may be related to higher rate of testing quality issues. Mean values much greater than median values indicates the presence of high number of testing outliers in upwind and background locations, skewing results. Concerning median, emissions were observed to be above background levels downwind of Vantage.

Note, the length of the Lake County Phase III ‘validation’ canister testing was also limited to only ten 24-hr test periods. While there were original plans to test Medline and Vantage EtO control systems for a longer period of time, permits and EtO control systems / approval were not in place during the longer Phase II testing period. Since this work, the US EPA, ATSDR and testing companies have also learned how to improve the quality and data analysis for TO-15/TO-15A canister testing [2]. This project is expected to finally provide the desired verification testing.

b. Address possible EtO medical device warehouse emissions. There is legitimate concern regarding the storage of recently sterilized medical devices with EtO. Repeated requests have been made to the IL EPA to assess emission levels from warehouses housing recent EtO sterilized medical devices in Lake County. By our understanding, no action has been taken at the state or federal level to address Lake County warehouses. Our community needs supporting data to accept that facilities in IL do not have this issue. Two separate facilities with recently sterilized product in Georgia, Cardinal Health and Becton Dickinson, have been found to exceed EtO emissions of > 4000 lb/year [4] and 5600 lbs/year [5] respectively, using independent third party testing. These levels were so high that the companies are required to obtain permits, under existing standards in Georgia. Even if EtO is being extracted 10 times better here in Illinois, facilities may be emitting 400 to 600 lbs/year, which is well over what is allowed from Vantage and Medline’s facilities in Illinois. With limited funds, concerned Lake County community activists strategically tracked the wind direction and placed canisters downwind of a Medline warehouse over two 24-hr periods and followed LC Phase I-III test protocols. Canister results indicated higher than background readings downwind of this facility [6]. To confirm these results, more thorough testing plans are needed in Lake County. This issue is not localized to Lake County residents only, rather it has national implications for other EJ communities living near EtO emitting facilities across the country. This study is expected to address this data gap.

c. Help understand discrepancies with permit models underestimating EtO emissions. There exist clear discrepancies between the permit model residential EtO levels for expected emissions and canister data acquired in residential areas, both in Lake County and at other sites across the US [7][8]. Based on analysis of available data and evidence, the permit model appears to underestimate the community levels of EtO around many of these facilities, thus underestimating cancer risk. AERMOD is primarily used to predict the high-end, ground-level concentrations that are generally used to assess compliance with air quality regulations. AERMOD is a good model at higher test concentrations and incorporates corrections for local buildings / topology. However, AERMOD has documented issues in peer reviewed publications with some conditions (ex: calm

days) and at lower emissions levels, found in the far-field from sources [9]. At distances farther from the facility and considering average emissions over longer periods of time, AERMOD has been found to underpredict ground level concentrations [5]. The issue is that this underestimates risk for residents around these facilities. Contacts with modeling experts at US EPA Region 5 and Research Triangle Park have been made by LCEW. New data from this project will be critical to resolving questions concerning model accuracy at residential locations.

d. Real-time fence-line monitoring demonstrator. Under this grant, there is an opportunity to explore community-based fence-line monitoring solutions to mitigate the risk of high use EtO facilities. Fence-line monitoring has been implemented by the US EPA for benzene monitoring at refineries, which is primarily emitted from fugitive ground-level sources [10]. One important goal of this project is to build and demonstrate a mobile test lab for ethylene oxide as a community-based fence-line solution, which would greatly mitigate cancer risk of living in Lake County IL.

Section 1. Project Summary and Approach – Overall Project Details: The project will consist of the following three primary tasks to achieve the above objectives (a)-(d):

Task 1: Build Mobile Air Monitoring Laboratory for EtO. Past EtO air quality testing was found to be of mixed quality with high uncertainty, primarily due to the limited data available acquired using TO-15/TO-15A canisters. One solution to address issues with uncertainty is to make more frequent measurements over a wider range of locations in the community. A mobile air monitoring laboratory (MAML) offers a flexible and cost-effective way to monitor air quality in communities that do not have fixed air monitoring stations. Mobile monitoring has been shown to be a useful approach for measuring variation of air pollution in urban environments. For example, prior work by Prof. Peltier's group demonstrated a mobile monitoring approach to study the spatial-temporal variability of air and noise pollution in urban neighborhoods [11].

To achieve mobile air quality monitoring, real-time sensing technology of EtO at ambient levels is needed. Picarro has been working closely with industry and communities to develop monitoring systems, based on Cavity Ring-Down Spectroscopy (CRDS), for ethylene oxide that meet current and future regulatory requirements. For example, Picarro offers an ethylene oxide analyzer, G2920, which has a lower limit of detection and is specifically designed for ambient and community monitoring [12]. This system provides fully automated, continuous operation with minimal maintenance requirements. It supports mobile applications through several power supply options (i.e. UPS). This system also provides detection of ppt, ppb and ppm fugitive emissions and support for mobile surveys, with proven expertise of over 15 years supporting global monitoring networks. Picarro systems have been integrated into mobile platforms for monitoring gaseous pollutants [13]. Lastly, community monitoring grants from the EPA have already been used to buy G2920 analyzer for EtO monitoring (by the Georgia EPD).

Lake County Environmental Works will lead the build and verification testing of a mobile air monitoring laboratory for Lake County IL. The platform will include a Picarro G2920 unit and a mobile weather station. Experience from Picarro and Prof. Peltier of University of Massachusetts Amherst will be incorporated in the design and implementation mobile laboratory, including the

power system and mobile transmission of data. Guidance on chemical testing and technical support will be provided by Prof. Ahmad Ali Audi at the College of Lake County.

Task 2: Conduct Test Plan. The test plan has multiple stages. First, building on the Phase I – III Lake County test plan, Task 2(a) will consist of a longer Phase IV plan TO-15/TO-15A canister is proposed [3]. Improved canister testing protocols for facility evaluation will be implemented based on best practices discovered through a recent EPA [2] and ATSDR review of EtO data acquired around the US. Highlights of the Phase IV test plan are as follows:

- Phase IV testing will repeat sampling at the same 12 canister sites, 5 near Medline, 5 near Vantage and 2 “Reference” locations in Gurnee. 20 total testing days, spaced over 60 days (testing every third day) using 24 hour TO-15/TO-15A canisters is proposed [3]. The Quality Assurance plan will be the same as before [3].
- Each morning, NOAA weather forecasts for expected wind direction will be consulted to determine the best position (of 12 clock position) for detecting downwind emissions. Two additional canisters will be positioned around the Medline and Vantage facilities, at fence-line locations, in the downwind direction. Prior data has shown that upwind canisters near these facilities do not detect downwind emissions, while downwind canisters do [3]. This strategy will mitigate the past issue of having no canisters downwind of these facilities.
- Once built and tested, the Mobile Air Monitoring Laboratory (MAML) will be used around these sites during TO-15/TO-15A canister testing. MAML will be able to provide data on ‘off days’ from canister testing and also provide local wind data. (This will be compared with the NOAA data acquired at the Chicago/Waukegan Regional Airport.)

Second, Task 2(b) will consist of a test plan to address fence-line monitoring of possible EtO warehouse emissions in Lake County IL. The community-based mobile real-time fence-line monitoring system will be used to assess possible emissions around all warehouses of concern with recently sterilized medical devices, throughout Lake County. This testing phase is expected to take approximately 3 months, following the Task 2(a). Again, NOAA weather forecasts for expected wind direction will be consulted to determine the best position (of 12 clock position) for detecting downwind emissions. A limited set of TO-15/TO-15A canister tests will be made in parallel with the MAML system to supplement testing data and help quantify downwind emissions versus background EtO levels in Lake County.

Task 3: Perform Data Analysis. The final step is data analysis of the two test plans addressing (a) verification of existing controls at Medline and Vantage and (b) study of possible EtO medical device warehouse emissions. First, data acquired will be reviewed, following the Quality Assurance Plan, to ensure data quality and identify possible poor data points, as observed in Phase III Lake County canister testing. Data analysis will also address weather data and distinguish upwind versus downwind emissions, which will be critical for. The LCEW team has considerable experience with data analysis. Results will be compared with AERMOD permit model results. Consulting assistance on data analysis will be provided by Prof. Peltier of University of Massachusetts Amherst.

Section 2A. Community Involvement - Partnerships: The goal of the organization is to lead on testing to address EJ concerns for the community and demonstrate a methodology for other communities in the country. LCEW will share all air monitoring results, data analysis, and

interpretations from this project with the public and all relevant state and federal agencies. Data will be shared with contacts at Lake County Health Department, the IL EPA, the US EPA Region 5 office, ATSDR, EPA air quality modelers, our Lake County communities, and IL executive and legislative government branches for decision making on follow-up steps. Collaboration is expected with College of Lake County.

Section 2B/C. Community Involvement – Engagement and Community-Based Organization

Set-Aside: Lake County Environmental Works is a 501(c)(3) organization composed of community members in Lake County. Our members have been actively advocating for EJ communities, on the issue of ethylene oxide since 2018. The members of LCEW have demonstrated effectiveness as a representative of the community in several respects. Team members have advocated to our federal, state and local representatives since 2018 for action on this health issue. They have led and participated in various information meetings at the Warren Newport public library to share updates on this issue with the community. They have contacted experts in federal (US EPA, CDC/ATSDR), state (IL EPA) and local (LCHD) organizations and provided their expertise and perspective on outstanding issues. They have also been interviewed by journalists with an interest in telling the story of the environmental challenges of overburdened communities [14].

Section 3 – Environmental Justice and Underserved Communities. A goal of this project is to address the fundamental tenants of Environmental Justice (EJ), to ensure the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, for those living near facilities emitting ethylene oxide. According to the USEPA, fair treatment “means no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies.” Our group believes that cancer risks must be reduced across Illinois, and that no particular group should suffer a disproportionate burden; we view the current situation as antithetical to the concept of environment justice.

Medline Industries is a commercial sterilizer located at 1160 Northpoint Boulevard in Waukegan, IL. Medline uses ethylene oxide to sterilize medical equipment and devices. Vantage Specialties, Inc. (Vantage), 3938 Porett Dr. in Gurnee, manufactures ingredients used in personal care, food and industrial products. The reactors in the alkoxylation area of the plant use ethylene oxide as a raw material. The ethylene oxide is piped into sealed reactors along with other raw materials. The ethylene oxide reacts with the other raw materials to form the desired chemical products. Medline and Vantage facilities are located within a three-mile aerial distance from each other, encircling several EJ communities in Waukegan, Park City, North Chicago, and Gurnee, IL.

Gurnee and Waukegan, Illinois, where Vantage and Medline’s facilities are located, are overburdened communities that deserve environmental justice initiatives by the USEPA. Park City and North Chicago, located immediately south of the Vantage and Medline facilities, are also EJ communities. These towns were designated as such through a calculation utilizing the USEPA tool EJ Screen [16] and a demonstrated higher risk of exposure to pollution based on environmental and socioeconomic factors.

In an Illinois Department of Public Health report “Cancer Incidence near Two Facilities Utilizing Ethylene Oxide, Lake County, Ill., 1998-2017”, the demographics were reported for the study group area including census tracts from Gurnee, Waukegan, Park City and North Chicago IL, based on the 2010 census data [15]. For a population of 60,190 living near these facilities, 18.1% were black, 39.6% were Hispanic, yielding a more diverse population than the rest of Lake County and the state of Illinois in general. The population was also much younger, and likely more transient, than the two referents considered in the cancer risk assessment study. [Note, while no definitive conclusions were made in this report, that was reasonably expected in hindsight given the expected cancer risk due to the presence of high levels of EtO, the demographics, and uncertainty in the study.]

Along with EtO, these communities face higher risks of air pollution from a variety of sources. Waukegan contains an Edison International coal plant, which was named as one of the worst environmental justice offenders in a 2012 NAACP report. According to a National Research Council, the coal plant is responsible for \$520 million and \$690 million in public health damages since 2002. This Waukegan coal plant is the largest source of air and water pollution in Lake County. The retirement of this plant has been the result of extensive community organizing efforts, which is an ongoing fight because the coal ash polluter is refusing to clean up the site. The nearby Waukegan Harbor has seriously contaminated the shore of Lake Michigan with polychlorinated biphenyls (PCBs). A newly opened Foxconn factory in Racine, WI threatens to worsen our region’s air and water quality by contaminating the headwaters of the Des Plaines River. Based on EJScreen [16], Figure 1 shows much of this area is above 90 percentile EJ Indexes for 2017 Air Toxics Cancer Risk and has a high Socioeconomic Demographic Index.

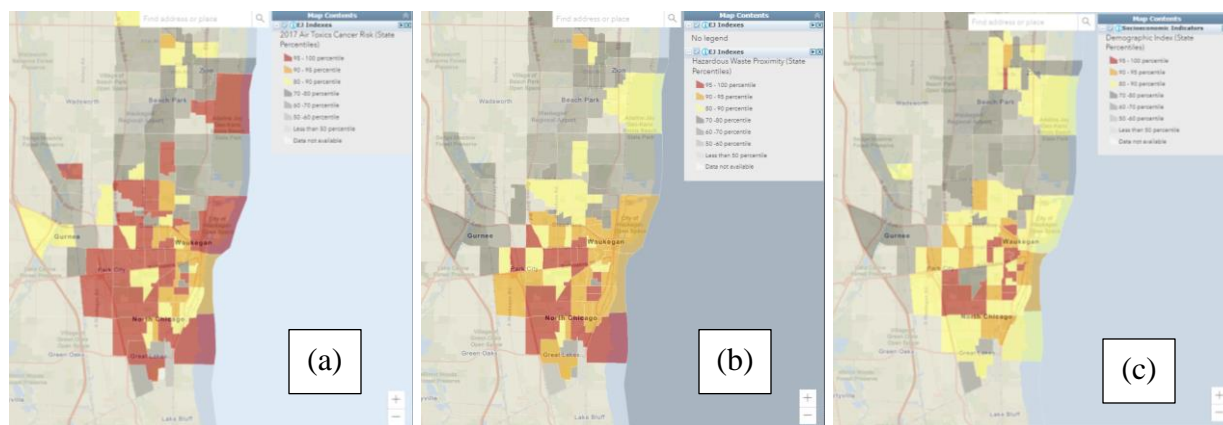


Figure 1. EJScreen Maps for Lake County region of concern: (a) 2017 Air Toxics Cancer Risk, (b) Hazardous Waste Proximity, (c) Socioeconomic Indicator - Demographic Index.

Gurnee, Waukegan, North Chicago, and Park City are prime examples of the overburdened communities that USEPA Administrator Regan and Assistant Administrator Starfield are calling to protect. But they are not the towns in Region 5 that received initial attention from USEPA. Willowbrook, Illinois, an affluent and less diverse community where Sterigenics was located, effectively petitioned the EPA for additional monitoring and action. Sterigenics was a commercial sterilizer operating in Willowbrook, IL. The Sterigenics facility in Willowbrook has not operated since a February 15, 2019 seal order was put in place; later the company indicated that it ceased operations permanently at the site. In contrast to Gurnee, Waukegan, Park City, and North

Chicago, Willowbrook is more affluent. Extending that same hand to our Lake County communities would further the USEPA's stated goal of environmental justice for all.

Most troubling is Medline and Vantage's proximity to schools and residential areas, which are populated with children, a clearly susceptible population. Fifteen schools are less than three miles away from the facilities. Spaulding School is under 3,500 feet away from Vantage. In comparison, Willowbrook's Hinsdale South High School, also located less than a mile away from an EtO-emitting facility, suffered greatly from the effects of inhaling ethylene oxide. The majority of those fifteen schools are located between Vantage and Medline. With residents living within 1.5 miles of Sterigenics possessing up to ten times a higher risk of developing cancer than other Willowbrook residents [17], this raises serious concerns for students attending any of the fifteen schools located between Vantage and Medline.

Section 4A – Environmental Results - Expected Project Outputs and Outcomes. This study will resolve past testing issues, by more directly investigating downwind emissions from these facilities and better assessing background levels of ethylene oxide in the community. As well, the data produced from this study will be critical for the verification of the permit models for simulating ground level fugitive emissions and average exposure in the community over time. The creation of a community-based mobile real-time fence-line monitoring system will become a valuable tool for testing over a much wider range of locations. As well, possible EtO warehouse emissions, which have yet to be studied adequately in Lake County, will be tested under this project. Such data from possible warehouse emissions will guide the possible legislation in Illinois on warehouse facilities and permit requirements. All project outputs will inform the community and ensure that the Lake County cancer risk matches the lower levels of risk found in the rest of the state of Illinois.

Section 4B - Environmental Results – Performance Measures and Plan. Data acquired during this project can be directly applied to address several outstanding questions for the community, (a) to validate that emission controls are working at Medline and Vantage facilities and (b) investigate the level of possible EtO warehouse emissions in Lake County from recently sterilized medical devices Olaguer et al. have demonstrated in Michigan how air quality measurements and data analysis techniques can be applied to assess emission levels emanating from facilities that emit ethylene oxide [18]. Best practices learned from statistical model work at ATSDR will be applied to the data and estimate emission levels and resulting increased levels of EtO experienced by residents of Lake County IL. These results will be compared to permit models and determine if there are reasons to investigate further possible high ground levels of EtO. Results will also be shared widely within the community that is continuing to study this issue.

Section 4C – Environmental Results – Timeline and Milestones. The expected start date for the project is January 2023. The one year and one month project timeline, with milestones is as follows:

1. **January 2023, Task 1a:** Finalize design of mobile air measurement lab, procure and install Picarro system, weather station, power source and mobile station trailer.
2. **February 2023: Task 1b:** Test Picarro in mobile lab and procure canisters for Task 2 testing. Finalize sampling plan and quality assurance procedures.

3. **March-April 2023: Task 2a:** Verification of existing controls at Medline and Vantage (i.e. Lake County Phase IV test plan). Acquire EtO samples over 60-day period using both TO-15/TO-15A canister testing and MAML.
4. **May - June 2023:** Send canisters to lab for analysis, Data review (from Task 2a), cleaning, and analysis phase, MAML performance assessment and calibration.
5. **June - August 2023: Task 2b:** Evaluation of possible EtO medical device warehouse emissions using MAML.
6. **Sept. - Oct. 2023:** Data review (from Task 2b) and analysis phase. Hotspot analysis with follow-up targeting sampling as needed.
7. **Nov. – Dec. 2023:** Draft report to EPA, hold community data dissemination event, publish methodology and guidance on real-time fence-line monitoring demonstrator for ethylene oxide.
8. **January 2024:** Final reporting to EPA, publish manuscript, share all results with all parties involved and media.

Section 5 – Quality Assurance Statement

Lake County Environmental Works, a community based group, will rely on existing best practices and Quality Assurance Project Plans (QAPP) that have been previously defined for Lake County TO-15/TO-15A canister testing for ethylene oxide [19]. The same plan will be applied to data acquired from the Picarro system. The technical POC will manage the data review process, with assistance from team members and partners. All data will be freely shared with the Lake County Health Department, as in past Phase I-III testing periods, and with other organizations with interest in community trends concerning ethylene oxide.

Section 6A – Programmatic Capability / Past Performance

Lake County Environmental Works is submitting for their first grant proposal for the “Community-based organization set-aside”. LCEW has no past funded assistance agreements to cite here. Dr. John Aldrin, the technical POC for Lake County Environmental Works, has over 20 years of experience in modeling and simulation, data analysis, inverse methods, and reliability assessment for various testing modalities. He has been involved with a number of Federal DoD and NASA contracts over the years (dba Computational Tools). Other LCEW scientific team members have knowledge and experience with best practices for TO-15/TO-15A canister testing. With limited funds, team members have performed TO-15/TO-15A testing in the past, following Lake County Phase I-III test protocols [6].

Section 6B – Programmatic Capability / Reporting Requirements

Lake County Environmental Works recently formed to become a grant-eligible 501(c)3 group; however, the members have worked on this issue since 2018 (as part of other organizations). We are submitting LCEW’s first grant proposal here, for the “Community-based organization set-aside”, and thus have no past funded assistance agreements to cite. However, our team members have previous experience with federal contracting and reporting requirements..

Section 6C – Programmatic Capability / Staff Expertise

Dr. John C. Aldrin obtained his Ph.D. degree in Theoretical and Applied Mechanics from Northwestern University in 2001, and Master's and Bachelor's degrees in Mechanical Engineering from Purdue University in 1996 and 1994 respectively. Since 2001, he has been working as the principal of Computational Tools, specializing in modeling and simulation, data analysis, inverse methods, and reliability assessment for nondestructive testing (NDT). Contracts have included a Visiting Scientist position with the Air Force Research Laboratory leading research on computational method in NDE, and participation in the NASA Engineering and Safety Center (NESC) Nondestructive Evaluation (NDE) Technical Discipline Team (TDT). Dr. Aldrin has co-authored over 170 journal, conference, and book publications in the field of nondestructive testing. He is an associate technical editor for Materials Evaluation and is a Fellow of American Society of Nondestructive Testing.

Tea Tanaka is a senior scientist with previous experience in TO-15/TO-15A canister testing. Ms. Tanaka has a Master's degree in Molecular Biology from University of Illinois at Chicago and a Bachelor degree in Biochemistry from North Central College. Ms. Tanaka has had an active involvement with our EJ communities, raising awareness of ethylene oxide, and explaining cancer risks to the public.

Section 6C – Programmatic Capability / Partner Expertise

Prof. Peltier – University of Massachusetts: Richard Peltier is an Associate Professor in the Department of Environmental Health Science. His research is in human exposure assessment to atmospheric pollutants. He holds a PhD in Atmospheric Chemistry, and a Master of Public Health in Environmental Health, and has more than 15 years of experience in analysis of ambient datasets, field monitoring, analytical chemistry, and interpretation of results for policy makers. He has been a part of our group for more than three years assisting us with understanding past and current ethylene oxide monitoring campaigned by EPA and ILEPA, and has regularly interacted with local and national media outlets on these issues. Dr. Peltier has included a letter of support in this application which illustrates the technical expertise and deliverables that he will provide to this project.

Prof. Ahmad Ali Audi at the College of Lake County: Dr. Ahmad Audi is an Instructor in Chemistry and the Chair of Nanotechnology program at the College of Lake County since 2007. He earned his PhD in Analytical Chemistry from Kansas State university in 2003. Dr. Audi chaired the Nanotechnology Dept at the college from 2010 to 2016, where he equipped the program with state-of-the-art equipment that are traditionally reserved for graduate students. During his nanotechnology tenure, he presented at local community events. He has been teaching an air quality related chemistry course since 2017, in which students perform related experiments and tour local related facilities. Dr. Audi has been active in supporting environmental testing in Lake County and worked with students on a past project testing EtO levels in Waukegan, IL.

Section 7. Budget:

Line Item & Itemized Cost	EPA Funding ^{**}
Volunteer Personnel	
(1) Technical POC (Volunteer)	\$0.00 ^{**}
(2) Project Testing Staff @ \$25/hr x 12 hrs/wk x 52 wks	\$15,600.00
TOTAL PERSONNEL	\$15,600.00
Travel	
Mileage for Staff: 50 mi/wk @ \$.17/mi x 52 wks	\$442.00
Prof. Peltier travel to Chicago (two nights) [Est. \$500 flight, \$300 car rental, Chicago per diem (\$216 + \$79)]	\$1500.00
TOTAL TRAVEL	\$1,942.00
Equipment / Service	
Picarro G2920 [Quotation # QU11300]	\$160,687.64
Weather station (see Weather Station Quote.pdf + tax)	\$1,100.00
Rechargeable power source	\$1,000.00
Remote wifi access	\$500.00
Trailer (see Trailer Quote.pdf + tax)	\$7,540.56
TOTAL EQUIPMENT	\$170,687.64
Contractual	
Rented Canisters + TO-15/TO-15A Lab Testing	\$56,000.00
Consulting Services - Prof. Peltier	\$15,000.00
Consulting Services – College of Lake County	\$5,000.00
TOTAL CONTRACTUAL	\$76,000.00
Other	
Community Meeting Logistics, Data Dissemination	\$3,000.00
TOTAL OTHER	\$3,000.00
Indirect Charges	
Federal Indirect Cost Rate x Personnel = Indirect Costs (Federal Negotiated Indirect Cost Rate = 20%)*	\$3,120.00
TOTAL INDIRECT	\$3,120.00
TOTAL FUNDING	\$270,349.64
TOTAL PROJECT COST^{††}	\$270,349.64

^{**} EPA Funding amount must be included on the SF-424 in Section 18.a and SF-424A in: cell 5(e) under Section A – Budget Summary; and Column (1) under Section B – Budget Categories.

^{††} Total Project Cost must be included on the SF-424 in Section 18.g and SF-424A in: cell 5(g) under Section A – Budget Summary; and column (5), Row k under Section B – Budget Categories.

* Lake County Environmental Works is a non-profit 501(c)(3) founded in 2/2022, thus indirect rates are based on projections.

^{**} All work on expected project by TPOC will be performed on a volunteer basis.

References:

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- [3] Ethylene Oxide Air Monitoring Results, Lake County IL. <https://www.lakecountyil.gov/4188/EtO-Monitoring-Results>. Raw data: <https://docs.google.com/spreadsheets/d/1mrY1MbFWUT5-ysl7SpD74CKMKOMo4x9i5wZArdYJ2k/edit#gid=1269948513>
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- [17] Eric Horng, EPA: Residents Within 1.5 Miles of Willowbrook Sterigenics Plant Had Up to 10 Times Higher Risk of Cancer, ABC 7 EYEWITNESS NEWS, (May 29, 2019) <https://abc7chicago.com/health/epa-residents-within-15-miles-of-sterigenics-plant-had-up-to-10x-higher-risk-of-cancer/5322586/>.
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- [19] US EPA. "Method TO-15: Determination of volatile organic compounds (VOCs) in air collected in specially-prepared canisters and analyzed by gas chromatography/mass spectrometry (GC/MS)." EPA/625/R-96/010b (1999).

Attachments:

Attachment File:	Attachment Description:
QA Statement - LCEW and epa-to-15_0.pdf	Quality Assurance Statement
Proof of Nonprofit Status - LCEW.pdf	Proof of Nonprofit Status
Community Based Organization - Support Letter.pdf	Community-based Organization Documentation
Picarro Quote - G2920 - QU11300.pdf	Quote from Picarro - G2920 and Support
2022_eto_LOS_PELTIER.pdf	Letter of Support from Prof. Peltier
Mobile Lab Quote Misc.pdf	Quotes for Mobile Lab Components
Aldrin_Resume_2022.pdf	Resume of TPOC, Dr. John Aldrin

